IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hideo Nakajima

Serial No.: 10/030,732 Art Unit: 1725

Filed: January 8, 2002 Examiner: Kevin P. Kerns

For: PRODUCTION METHOD FOR POROUS METAL BODY

DECLARATION

Honorable Commissioner of Patents and Trademarks

Washington, D. C. 20231

SIR:

I, Hideo Nakajima, of 6-40, Goban-cho, Hiyoshidai, Takatsuki-shi, Osaka 569-1022 Japan, declare that:

1) I graduated from TOHOKU University, with a Doctorate in Engineering in 1977. Since 1996, I have been a Professor of the Institute of Scientific and Industrial Research in Osaka University. For more details see the attached C.V.

2) I am the inventor of the above-identified application, and am familiar with the subject matter of said application as well as the disclosures of the cited references.

3) In order to demonstrate the differences between the present invention and the prior art, the following experiments were carried out under my direction and supervision.

Experiment

The purpose of these Experiments was to investigate the effects of the present method when a porous material is maintained under a reduced pressure to degass the raw metal material before melting, in comparison to a porous metal obtained without such degassing.

(1) Method

(a) Iron raw material (99.99% purity) was maintained for 0.1 hour at 1470°C and 5×10^{-2} Torr. Mixed gas of Nitrogen and Helium was introduced, and then the iron material was melted for 20 minutes at 1800°C under a pressurizing gas atmosphere (1.0 MPa N_2 + 0.5 MPa He). Then, under the same pressurization conditions, the molten iron having the gas dissolved therein was poured into a cylindrical mold (100 mm high, 30 mm inside diameter) and solidified from the bottom to the top by means of a water cooling mechanism provided

at the bottom of the mold, yielding a porous iron cylinder (porosity : 43%).

(b) Iron raw material (99.99% purity) was heated to 1470°C under a pressurizing gas atmosphere of 0.5 MPa Helium. Nitrogen was introduced, and then the iron material was melted for 20 minutes at 1800°C under a pressurizing gas atmosphere (1.0 MPa N_2 + 0.5 MPa He). Then, under the same pressurization conditions, the molten iron having the gas dissolved therein was poured into a cylindrical mold (100 mm high, 30 mm inside diameter) and solidified from the bottom to the top by means of a water cooling mechanism provided at the bottom of the mold, yielding a porous iron cylinder (porosity : 43%).

(2) Evaluation

The corrosion resistance of a sample of each of porous iron (a) and (b) obtained above was evaluated as mentioned below.

A) Corrosion resistance against 20% sulfuric acid

Each sample of porous iron (a) and (b) was prepared in the form of a disc (10 mm diameter, 1.3 mm thickness). The two sample were maintained in a 20% sulfuric acid solution for 12 hours. The amount of each sample remaining was measured and the Corrosion rate was calculated.

B) Corrosion resistance against 30% nitric acid

Each sample of porous iron (a) and (b) was prepared in the form of a disc (10 mm diameter, 1.3 mm thickness). The two sample were maintained in a 30% sulfuric acid solution for 15 minutes. The amount of each sample remaining was measured and the Corrosion rate was calculated.

Results

The results of evaluation A and B above are shown below:

A: Corrosion rate with 20% sulfuric acid

	Corrosion rate ($mg\ cm^{-2}\ h^{-1}$)
(a)	2.11 ± 0.11

(b)	2.31±0.19

B: Corrosion rate with 30% nitric acid

	Corrosion rate (mg cm^{-2} h^{-1})
(a)	179±10
(b)	199±13

Consideration of the results of experiments

From the results shown above, the corrosion of porous metal (a) obtained with degassing was slower than that of porous metal (b) obtained without degassing.

The result confirms that by degassing the raw metal material before melting the metal, the corrosion resistance of a porous metal is improved.

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false

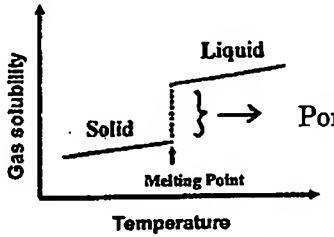
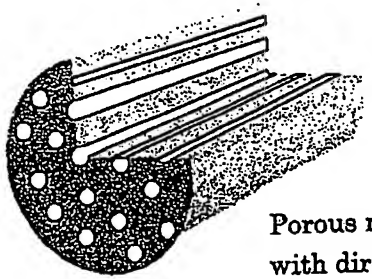
statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: November 5, 2005 Hideo Nakajima

Hideo Nakajima

(4)

Table 1 Schematic distinction in gas formation

Technique	JP3-17236	Our invention
principle	The bubbles are expanded by depressurization during melt condition	The insoluble gas forms pores when the melt is solidified during solidification process
Schematic	Melt condition Pressure p → p' (p≫p')  bubble volume V → V'	  Porous metal with directional pores